DATA SET
EXPLORE 2 LESSON 21

Study 1

Early postexercise muscle glycogen recovery is enhanced with a carbohydrate-protein supplement

Publish Date: July 2, 2002
Journal: Journal of Applied Physiology
Authors: John L. Ivy, Harold W. Goforth, Bruce M. Damon, Thomas R. McCauley, Edward C. Parsons and Thomas B. Price
Link: https://doi.org/10.1152/japplphysiol.00394.2002

Overview of the Study
Researchers set out to they the hypothesis that a carbohydrate-protein (CHO-Pro) supplement would be more effective in the replenishment of muscle glycogen after exercise compared with a carbohydrate supplement of equal carbohydrate content (LCHO) or caloric equivalency (HCHO).

To test the hypothesis, seven trained male cyclists participated in an experimental protocol. They were initially tested to determine their maximum cycling output and maximum heart rate. Those numbers were used to determine the pace and resistance settings for their workouts during the investigation. Each participant completed two hours of cycling at 65-75% max effort. Then, they completed a series of one-minute maximum effort sprints followed by one minute of cycling at a leisurely pace. This series of sprint-recovery was repeated until each participant's blood glucose level had dropped to a point that indicated their liver glycogen supplies were depleted. At this point, participants stopped exercise, consumed one of three recovery drinks, and entered the four-hour (240-minute) recovery period. At 120 minutes into the recovery period, the participants consumed a second dose of the same recovery drink they consumed immediately after exercise.

Muscle glycogen levels of the quadriceps muscles were measured by using nuclear magnetic resonance imaging (C-NMR) machines. A C-NMR scanning probe rested on their mid-thigh during both the exercise and recovery periods. Scans to measure glycogen of the quadriceps muscle were taken pre-exercise, immediately after the sprint intervals ended, and during the recovery period after 20, 40, 60, 120, 180, and 240 minutes.

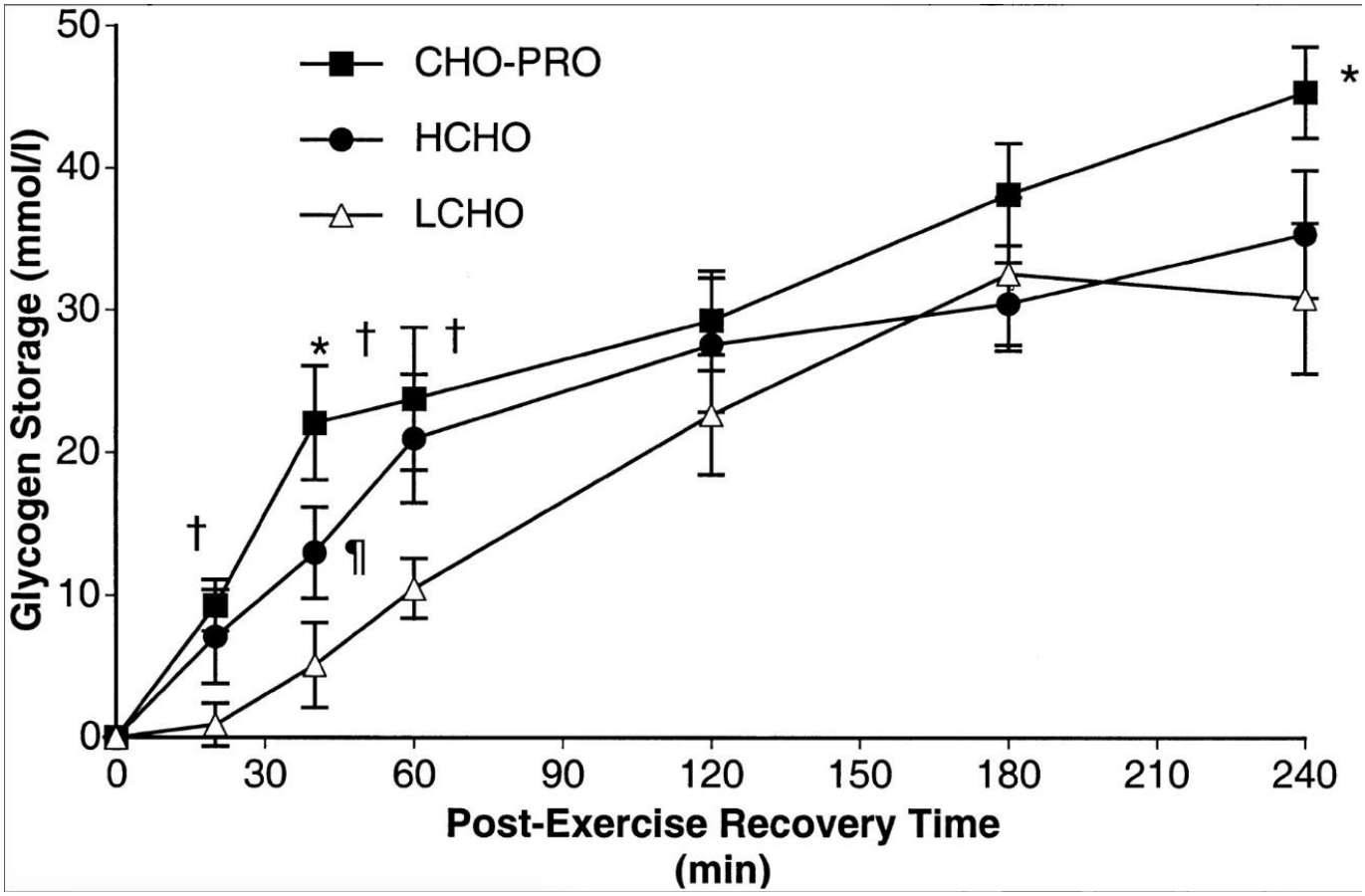

Figure 1. Patterns of muscle glycogen storage during recovery as determined by nuclear magnetic resonance spectroscopy for the carbohydrate-protein (CHO-Pro = closed square), isocarbohydrate protein (CHO-PRO = open triangle), and isocaloric carbohydrate (HCHO = closed circle) supplements. Supplements were provided immediately after and two hours after exercise. *CHO-Pro significantly different from LCHO and HCHO (P<0.05) † CHO-Pro significantly different from LCHO and HCHO (<0.05), ¶HCHO significantly different from LCHO (P<0.05)

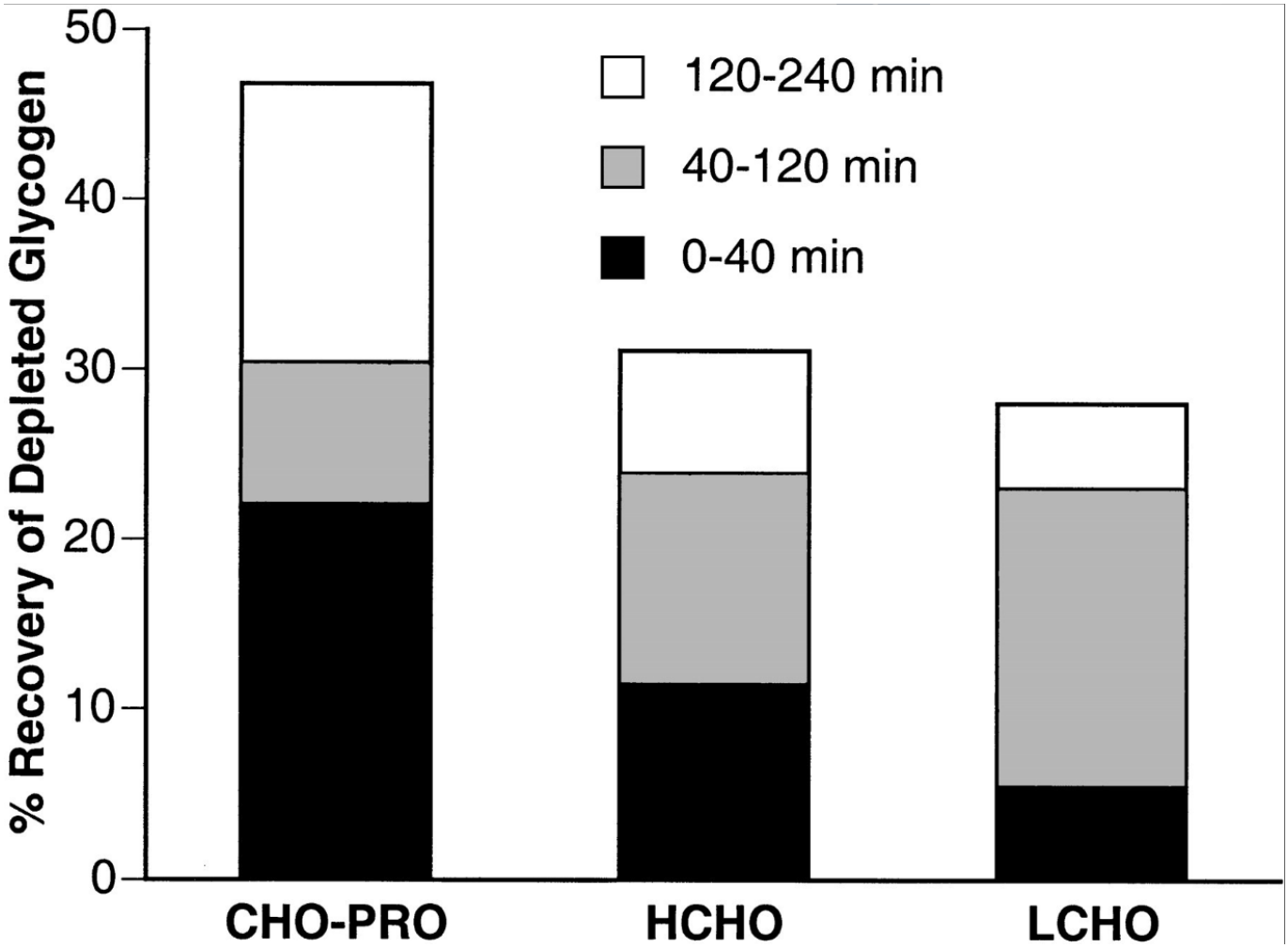

Figure 2: Percent recovery of depleted glycogen stores of the vastus lateralis from 0 to 40, 40 to 120, and 120 to 240 minute recovery. Initial and postexercise muscle glycogen stores were not different among treatments.

Study 2

Effects of postexercise carbohydrate-protein feedings on muscle glycogen restoration

Publish Date: June 2000
Journal: Journal of Applied Physiology
Authors: John A. Carrithers, David L. Williamson, Philip M. Gallagher, Michael P. Godard, Kimberley E. Schulze, And Scott W. Trappe
Link: https://doi.org/10.1152/jappl.2000.88.6.1976

Overview of the Study:

Scientists wanted to determine the effects of consuming three different carbohydrate-protein beverages on muscle glycogen restoration after an exhaustive cycling workout.

To accomplish this, eight collegiate male cyclists participated in a cycling protocol. Participants completed a 75-minute cycling workout at 70% of their max effort, followed by six one-minute sprints at 125% max effort, with six one-minute rests in between each sprint. The last sprint was followed by a four-hour recovery period.

Consumption of the first recovery beverage occurred immediately after the final sprint. For the remainder of the restoration period, subjects consumed seven additional feedings, each separated by 30 min. The last recovery beverage was consumed at the 210-minute point for a total of eight feedings. For each trial, participants were assigned either a carbohydrate drink (CHO), a carbohydrate/protein drink (CHO-PRO), or a carbohydrate-amino acid drink (CHO-AA).

At the conclusion of the final sprint, a muscle biopsy was obtained with the aid of suction from the vastus lateralis muscle. The time from cessation of exercise to the muscle biopsy was ~2 min. At the conclusion of the 4-h restoration period, another needle biopsy of the vastus lateralis muscles was obtained. Concentrations of muscle glycogen were measured and calculated from the muscle biopsy samples taken.

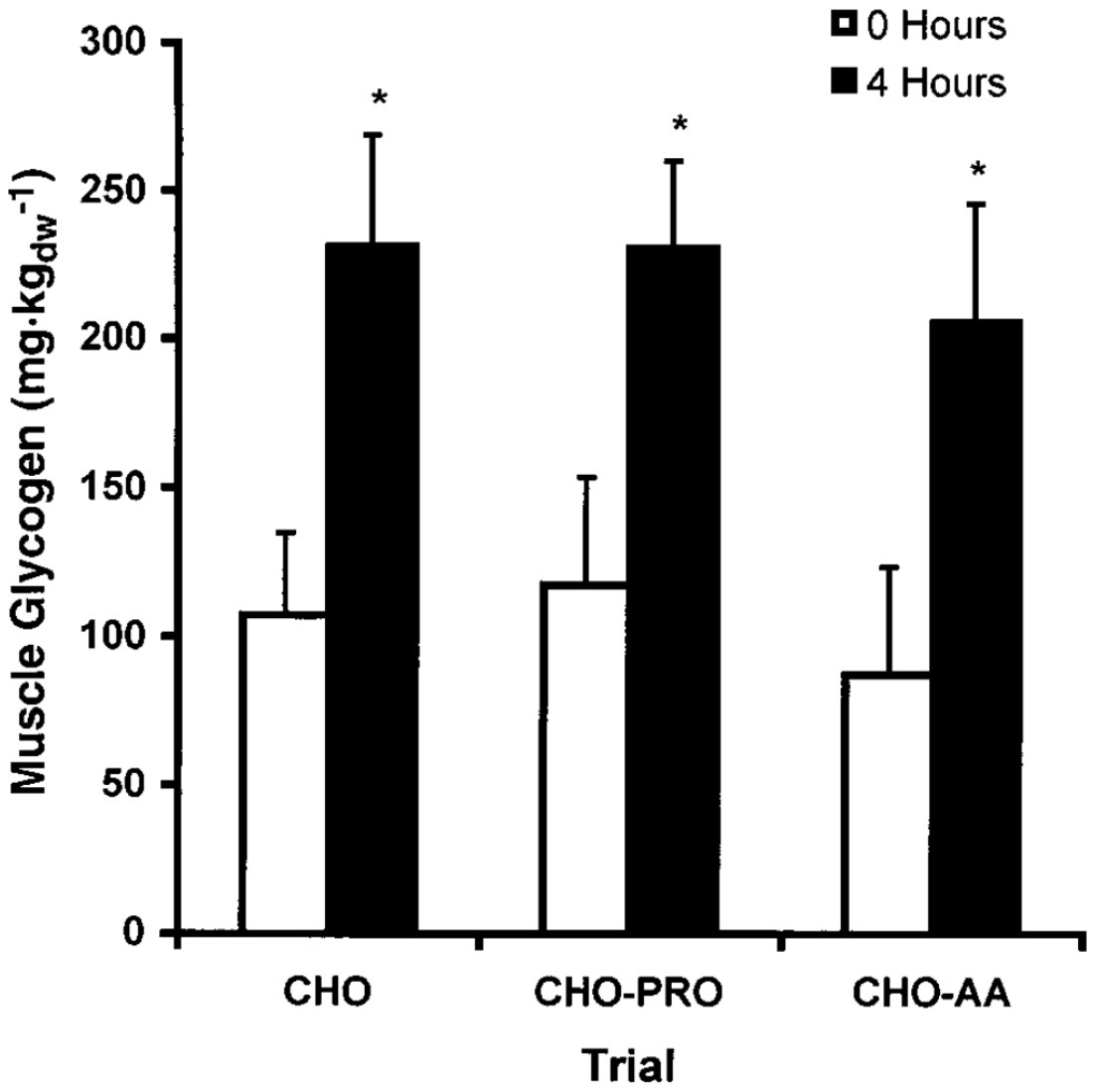

Figure 3: Muscle glycogen concentrations immediately after exhaustive exercise (white bars) and at the conclusion of the 4-h muscle glycogen restoration period (black bars). Values are means +/- SE. dw, Dry wt. *P<0.05 from 0 to 4 hours for muscle glycogen concentrations.